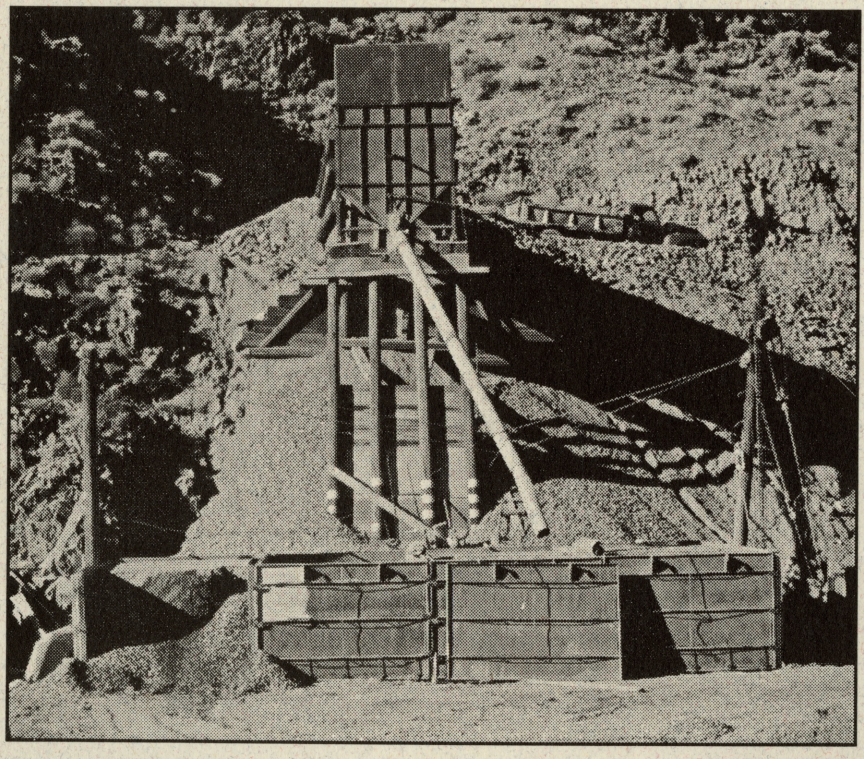
JOURNIGAN'S TUCKI GOLD MINE



BY

RUSS JOURNIGAN

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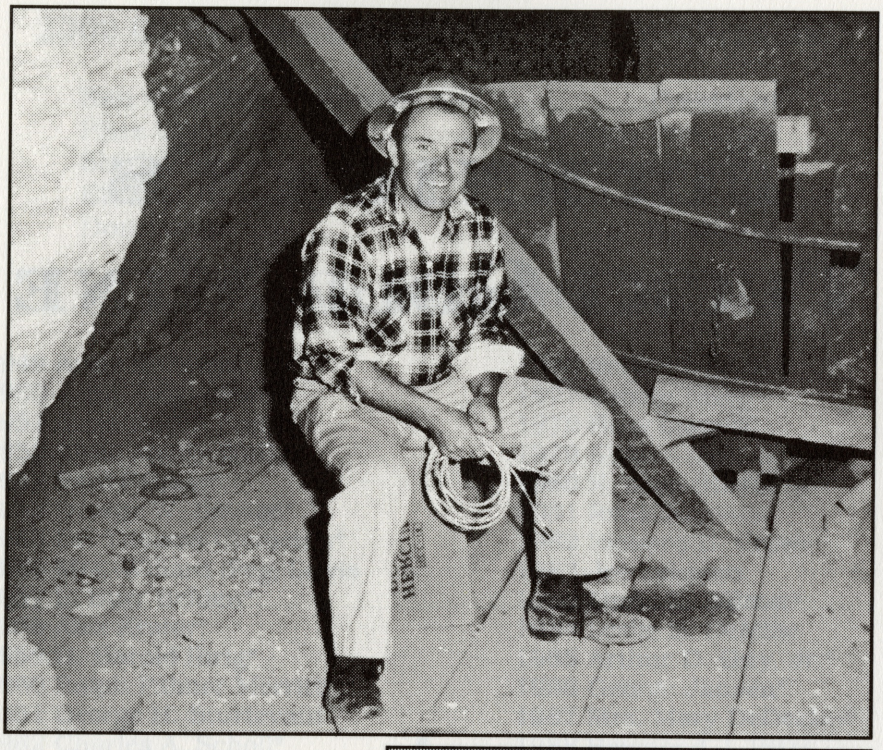
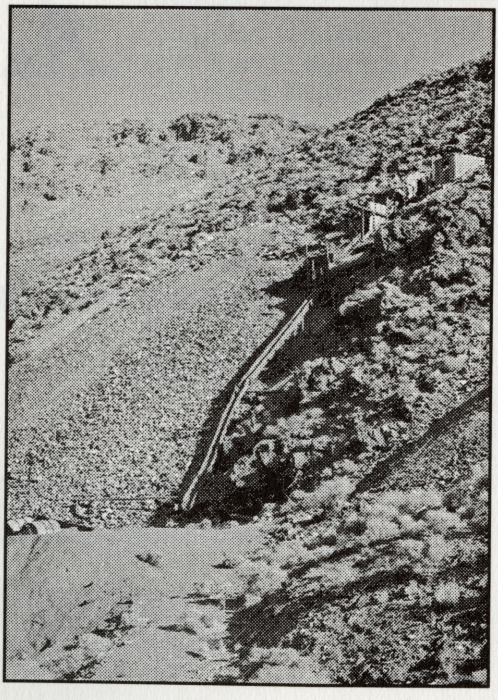


Russ Journigan on the 245-foot level preparing to blast. Photo by Harry Merrick



Tucki Mine 5,000-ton ore dump, ore chute, and hoist house. (View SE) Journigan photos unless otherwise noted.

Cover photo *Tucki Gold Mine ore bin with ore chute suspended over four cyanide solution tanks.* Harry Merrick photo

The Tucki Mine Group was discovered and located in 1927 by Charlie Walker, John Millett, and Sam Ball. Roy Journigan, my father, grub staked the locators.

There were four adjacent claims located: Tucki, Tucki #1, #2, and #3. Each claim was 1,500 feet long and 600 feet wide—the usual size for locating lode claims. There was a discovery monument on each claim—rocks piled up to make a monument. Each claim corners was also made of piled up stones, as wood was scarce at the time.[1]

The mine is situated on the southwest side of Tucki Mountain and about three miles over a steep ridge, northeast of the old town site of Skidoo. A road had to be built to the mine, starting in 1928, coming up Sheep Wash from Telephone Spring, a distance of eight miles. The road was not completed until 1930. There was already a road from Towne Pass Wash that terminated at Telephone Spring. It followed part of the telephone line to Skidoo. (See map inside back cover.)

The ore was worked from 1927 to 1944 when a moratorium was signed by President Roosevelt that stopped production from all gold mines because during World War II gold was not considered a strategic metal. Also, drill steel and powder were getting exceedingly difficult to purchase coupled with the problem that most of the miners were in the military or working in the defense industries.

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[1] According to the *Historic Resource Study: a History of Mining Vol. I part 2* by Linda Greene, Henry W. Britt (or Birtt—writing illegible) filed a Notice of Location for the Tucki No. 1 on April 12, 1909, with a description of it as being "about 3 miles NE of Skidoo." Activity between 1909 and 1927 was apparently inconsequential. The property appears to be the same as that later claimed and located by Walker, Millett, and Ball in September 1927. In 1937 Sam Ball and Ed Attaway, who was deeded 1/4 interest, were working the mine and trucking their gold ore to Death Valley Junction for shipment to the smelter. In April 1939, Roy Journigan became a part owner of the mine with Attaway and Ball, and they leased the property to others.

During this time (1929-1934) Roy Journigan, my dad, purchased three-quarters of the interest in the mine from the original locators for a nominal sum. During the late '30s, the Tucki ore was processed at the Journigan Gold Bottom Mill in Emigrant Canyon, along with some of the ore being processed at the Hell's Garden arrastre at Telephone Springs, run by Ike Steinberger, a friend of my father.

From 1941 to 1943, a group of miners from Lone Pine leased the Tucki Mine from my father and installed a crude cyanide plant to process the ore. The water was hauled from Telephone Spring for domestic and mining purposes.

The Tucki Ore

The Tucki ore was based in a fractured quartsite formation with no definable ore vein. Fire assays had to be taken daily from the jack hammer dust to check for the highest values.[2] We followed the direction of the highest gold values in order to get money to sustain the operation. This venture took us in various directions with the drifts (horizontal underground mine passage following a vein). The different mining levels were about 70 feet apart branching out from the inclined shaft that went to a depth of 310 feet. The ore was hoisted from the inclined shaft and run over a 3/4-inch screen with the fines going into steel leach tanks that were made from narrow gauge railroad cars.

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[2] A fire assay is used to measure gold and silver values in an ore. The ore is ground up, weighed, and put into a crucible where fluxes are added. The crucible is put into a furnace where the material is heated until the ore is fused (melted) with the lead flux (litharge). The fused ore (charge) is taken out and poured into a cast iron cone mold where the lead, with the gold and silver, sinks to the bottom of the mold. The lead button (with the gold and silver) is broken off the slag and formed into a cube with a hammer and tongs. The cube is then put on top of a cupel (a cup made of a cement-like material) and put back into the furnace at a lower temperature. The lead melts and is absorbed into the cupel leaving only the gold and silver on top of the cupel. If there is silver in the sample, it needs to be "parted" from the gold with nitric acid (putting the silver into a silver nitrate solution). Washing the residue leaves only the gold, which is then weighed on a analytical balance to determine its value and fineness (purity).

Most of the gold was in the fines so it was not necessary to crush and mill the ore before cyaniding. The gold in the Tucki Mine ore is finally divided in size, the gold grains passing through a 100-mesh screen. Gold from the Tucki measured the highest fineness (purity) of any of the gold-producing mines in the Panamint Range measuring from 981 to 990 fine out of a possible 1,000. It was very amenable to the cyanide process and the gold recovery using this process was very high.

The Underground Workings

On the Tucki #1 claim, an adit (horizontal mine shaft) was driven about 70 feet into the mountain from the discovery monument where a vein was intercepted, which we followed down by a vertical shaft to a depth of 65 feet. In the days of the Great Depression, it was necessary to follow the gold in the ore. This development was done by a man named Crumrine, a friend of my father, and at one time a part owner of the claim. The ore was sorted, and the richest ore was carried out by pack animals, since the road to the mine had not been built yet (circa 1929.)

Additional development was conducted on Tucki #2 from an outcropping on top of the hill at the discovery monument. This prospect lead to the development of an inclined shaft to follow the values of the ore as it tipped at about a 45-degree angle to the southwest. Charlie Walker, who had lived in Beatty, Nevada, along with Sam Ball an old prospector, started sinking the shaft. Sam brought in an old wooden house trailer, and Charlie Walker put up a bunk house and a cook shack to live in while this work was being done. The buildings still remain.

When the road to the Tucki was completed in 1930, my father bought an old Model T Ford truck with a two-speed rear axle, called a Ruxtell, to haul the ore out and haul water in for domestic purposes. One of the problems in hauling the heavy loads out was that it was necessary to climb a steep hill that divided Sheep Wash from Tucki Wash, about a half a mile up from the mine site. We would try to get a running start, but sometimes the old truck would stall, and we would have to back down and throw some ore off to lighten the load and try again. This problem

was solved when my father brought over his Fordson lug-wheeled tractor from the ranch in Lone Pine to help pull the old truck over the grade!

Before construction of the Gold Bottom Mill in Emigrant Canyon, some of the Tucki ore was processed in a device called an "arrastre" at Telephone Spring. Ike Steinberger, a friend of my dads, operated this crude machine of Mexican origin. Ike's company was called Hell's Garden Mining Company, and the logo on his letterhead read, "The Mills of the Gods Grind Slowly, But Exceedingly Fine"! I always remembered that statement. The arrastre consisted of a circular stone tank with a flat, stone-lined bottom with the stones cemented together to hold an ore-laden pulp. A series of drag-rocks were connected by chains to gears driven by a vertical, single cylinder, 15 hp Fairbanks Morse diesel engine furnished by my father. Ike allowed us to process the Tucki ore free of charge. The ore was fed into the arrastre, and the drag-rocks moving around in a circular fashion ground up the ore. The sand settled to the bottom where pure mercury was added as needed to amalgamate the gold from the ore. There were no amalgam plates, just the flat stone bottom. Needless to say, this was a very inefficient operation, but we had no other place close by to process the ore. We needed the money from selling the amalgam to help pay for food and labor to continue the development of the mine until the Gold Bottom Mill was built in 1934.

There was not enough water at Telephone Spring to support a larger mill or my father would have built it there, being only eight miles from the Tucki Mine. The old arrastre is still at Telephone Spring but has since been damaged, I guess, by persons trying to get some remaining gold that may have become lodged in between the cemented rocks in the bottom.

The arrastre originally was used to process ore from the Saddle Rock Mine, a very rich brown ore of a volcanic texture with "wire gold" strung through it—some of the most beautiful "picture rock" I had ever seen. Ralph Merritt

owned that mine and was also a good friend of my father.[3] His mine was located about three miles up Telephone Canyon from Telephone Spring on the trail to Skidoo where the telephone line had been constructed from Rhyolite to Skidoo in 1907 at a cost of $9,000.

Work continued at the Tucki Mine with dad doing the assaying and various miners cutting samples as they went.[4] The ore was stockpiled in an ore dump until the Gold Bottom Mill was completed as an amalgamation plant in 1934. We then started to haul the ore (with a better dump truck) to the Gold Bottom Mill for processing. At the mill my father taught me fire assaying, which I used in my later gold ventures.

In 1933, by Presidential Proclamation, President Hoover made the Death Valley area a National Monument. Because of the Great Depression and the many people trying to make a living in the Death Valley area, the Organic Act stated that "mining activities in the Monument would not be interfered with." This was an unusual statement since all other areas administered by the Park Service had outlawed such mining activities.

T.R. Goodwin was the engineer in charge, and he brought in the C.C.C. boys to improve the roads. Most of the boys I became acquainted with didn't like the hostile environment afforded them in Death Valley and would rather have been in the Sierras cutting trails in the high country.

We always had a high regard for the earlier Monument leaders, and it seemed that we were on the same team in helping to develop the area. Certainly development of the roads in the Monument was a great boost to our morale along with the saving of many blown out tires!

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[3] Ralph Palmer Merritt was a '49er President, Director of Manzanar during World War II, and a friend of President Herbert Hoover.

[4] Cutting samples gave miners an indication of the ore values in various parts of the mine. Samples of ore dust were put in numbered bags, and these "cut" samples were fire assayed to determine their gold values and what direction to tunnel to maintain a profitable mine.

A good example of our mutual cooperation is a letter from T.R. Goodwin written to my dad suggesting that if we would furnish the blasting powder to the Park Service, he would furnish the manpower, (i.e., the CCC boys), to rebuild the Skidoo Pass road. At the time, we were hauling ore from the Skidoo mine to the Gold Bottom Mill, and the road was narrow and dangerous, being one lane on blind curves. We provided the powder, and in a cooperative effort, the road was made less dangerous by providing a couple of turnouts at strategic places.

After the Gold Bottom Mill was up and running in Emigrant Canyon in 1934-35, the mining community in the Panamints started to take notice. We had the only mill in the country, with the exception of a small operation run by E.B. Starr and Walter Hoover located at Upper Emigrant Spring. The rock foundations of that mill can still be seen there. It ended up a failure.

My father found out that the Tucki Mine production could not keep up with the mill production, especially on a 24-hour basis. Because of the interests of some of the people who were developing mines in the area, my dad decided to do custom milling to keep the mill operating full time. We charged seven dollars per ton of ore for doing the custom milling and we did the truck hauling. Persons desiring to use our mill facilities were W.B. Gray, who at the time owned the Skidoo Mine; Pete Aguereberry who owned the Cashier and Napoleon Mines; C.O. Mittendorf who owned the Gold King Mine close to the mill; my father, who owned the Gold Bottom Mine about a half mile north of the Skidoo town site (leased by Charles Eckland); the Allens who had the Sunset Mine on the road to Skidoo; and others. We became quite busy custom milling along with processing the ore from the Tucki Mine.

Pete Aquereberry

We had known Pete Aguereberry for a long time. He was a very neat man and his camp was as neat as a pin. He cut his own hair and was always clean shaven. Much has been written about him and looking back to our acquaintance with him, in addition to his neatness, he was somewhat suspicious of most people. When we were running his ore, he

would always drive his model A Ford pickup from Harrisburg Flat down to the mill to watch his ore go through our mill. I guess he wanted to make sure that we weren't going to screw him out of anything.

My father one day asked him how much he wanted for his mine, and he said $100,000 cash. I am sure if you had given him $50,000 in gold he would have taken it. He had worked his mine for about 40 years, and most of the underground activities he performed by hand, using the "single jack" method of drilling holes for powder. Later in his life, his nephew, Ambrois Aguereberry, talked him into getting an air compressor and a jack hammer to do the drilling. I can say one thing about Pete: His underground mining work was as orderly as he lived his life on top. I have never been in a mine so neat. Not a rock out of place! Pete's ore was more complex, and thus more difficult to run, as it had some sulfides in it that hindered the recovery, compared to other free-milling ores in the area. We didn't mind him checking us out, as he was always a gentleman when he visited us at the mill.

The Tucki Mine Restart

Assessment work had to be done yearly to hold the unpatented mining claims. This work was burdensome but somewhat fun to do. We were usually accompanied by friends of ours who went along to help us. In the late 1940s I met Harry Merrick, a commercial photographer from Long Beach, and his family accompanied us on many trips to the Tucki Mine to do their share of road work in order to get to the mine so that we could all camp. This covered a period in the '50s and '60s, and the families enjoyed the outing during those times. The Merricks usually slept in campers, and the Journigans slept in the old bunk house with the trade rats that would keep us awake all night.[5]

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[5] "Trade rats" were large desert rats that frequented most of the mining camps in the Panamints. They stole food or bright colored objects like money, and took the loot back to a rat hole, then return to the scene of the crime with a bunch of pebbles or pieces of brush to complete the "trade." One night we lost a whole box of cherries and wondered why the dog was barking so much.

My father had always thought that the Tucki Gold Mine showed promise, and because I had caught the "Gold Bug" back in the late '30s working as a kid at Skidoo, Tucki, and Journigan's Gold Bottom Mill, my mind started going over the idea of starting a modernized cyanide processing plant at the Tucki. I studied the new process that Howard Hughes had put in with the Summa Corporation in Nevada. It showed promise in processing carbonaceous gold ore on a massive scale, but maybe I could scale down the operation. I became the first gold mine operator in California to install an active carbon cyanide processing plant, having built the plant at the Tucki Mine in 1973.

I lost my job in Hawaii, where we lived at the time, when a Governor of Japanese descent was elected and filled my job with one of his cronies. The time seemed right for a move in a new direction.

Paul Barnett, a plastering contractor in Hawaii, was interested in putting his time and money in the project. I would design the processing plant, and Paul and I, along with my family members, would build the plant at the Tucki Mine.[6]

The Water Problem

Water in Death Valley has always been a problem. My father had developed the springs adjacent to the Journigan Gold Bottom Mill years before. The water was not now being used, and I attempted to regain the water rights. In the meantime, about 1972, the Park Service had appropriated all the rights to the springs that my dad had developed, and they would not allow me to redevelop them. In fact the Park Service would not allow me to appropriate any water inside the Monument for mining purposes. This was a blow to the project. They could not stop us from putting in a cyanide processing plant at the Tucki, but we couldn't use any Monument water to run the operation!

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[6] Paul and his wife Sherry stayed at Panamint Springs. After the plant was completed, Lee and I ran the whole process by ourselves. We were a good team and some of the happiest times of our marriage were at the Mine. I taught Lee to do the crushing and some of the chemistry in the cyanide process. I couldn't have run the operation without her.

The nearest water source outside of the Monument was at Panamint Springs, 40 miles from the mine. Arrangements were made to purchase water for one cent per gallon. We bought a water truck and hauled water over Towne Pass to the Emigrant Canyon-Wildrose road, across Emigrant Wash to the mouth of Emigrant Canyon, then back down the wash to the entrance to Sheep Wash, up Sheep Wash to the mouth of Telephone Canyon and on up the wash on our dirt road to the mine.

Bad Storm

One day my wife Lee and I came in with provisions for the camp and ran into a summer cloud burst. We did manage to get across Emigrant Wash, but in Sheep Wash the water and rocks were cascading down the canyon with such force that I decided to get the truck onto higher ground to keep us from getting washed away. We left the truck and hoofed up to the mine, a distance of about eight miles, to get the BOBCAT so we could come back and get the provisions left in the truck including some un-refrigerated meat.

When we got to camp it was dark, and still raining heavily. I put Lee in the bucket of the BOBCAT holding a flashlight since the BOBCAT didn't have headlights, and she pointed out our way until there was no more road that we could make out. The whole canyon had changed its contour with new rocks replacing our washed-out road. Water and rocks were coming out of the upper side-canyons and flowing into Sheep Wash. To make things worse, the batteries went out on the flashlight, and the only light we had was from lightning flashes, which helped us a little.

We finally got back to the truck and loaded the supplies into the bucket of the BOBCAT along with Lee's cosmetic case. We left the truck there since the water had not receded, and we would have a better chance of making our way with a four-wheel drive BOBCAT than with a pick-up truck. So we came back in the front loader with Lee hanging in the bucket with the supplies.

The lightning was so bad that the large-meshed screen that covered the top of the loader became charged, and sparks were flying in all directions to get to the ground. I

kept telling Lee not to worry as we were on rubber tires insulated from the wet ground—but I wondered! When we finally got back to the mine it was just before daybreak and the bed felt good after that long night.

On the way back to the mine in the dark, Lee's cosmetic case had fallen out of the bucket, and I had run over the case. The next day we found it all smashed up when we went back to get the truck after the storm had subsided. Lee was not too happy about her loss.

The Ore Bin

It was necessary to construct an ore bin above the cyanide tanks so that gravity could move the ore into the individual tanks as needed. We fabricated an eight-inch pipe, with my son Daren (age 12) doing his first welding job. The long pipe, or chute, had a swivel at the opening of the ore bin, and the chute was positioned by a cable to hover over the selected leach tank for loading.[7]

The ore bin sat on top of four long telephone poles that leaned into the hillside where eight other telephone poles were erected on a horizontal plane. The space between was filled with rock to make a road bed for the dump truck to unload ore into the bin that held about 30 tons of rock when filled.

We borrowed a D-8 Cat to cut a road into the hillside to get to the ore bin above the cyanide tanks.

The Crusher Operation

In order to maximize the Tucki Mine operation, we had to crush the dumped ore down to a size that would insure good percolation of the cyanide solution in the leach tanks. I decided that it was necessary to have an ore size of minus 0.5 inch to get the intended recovery of gold from the ore.

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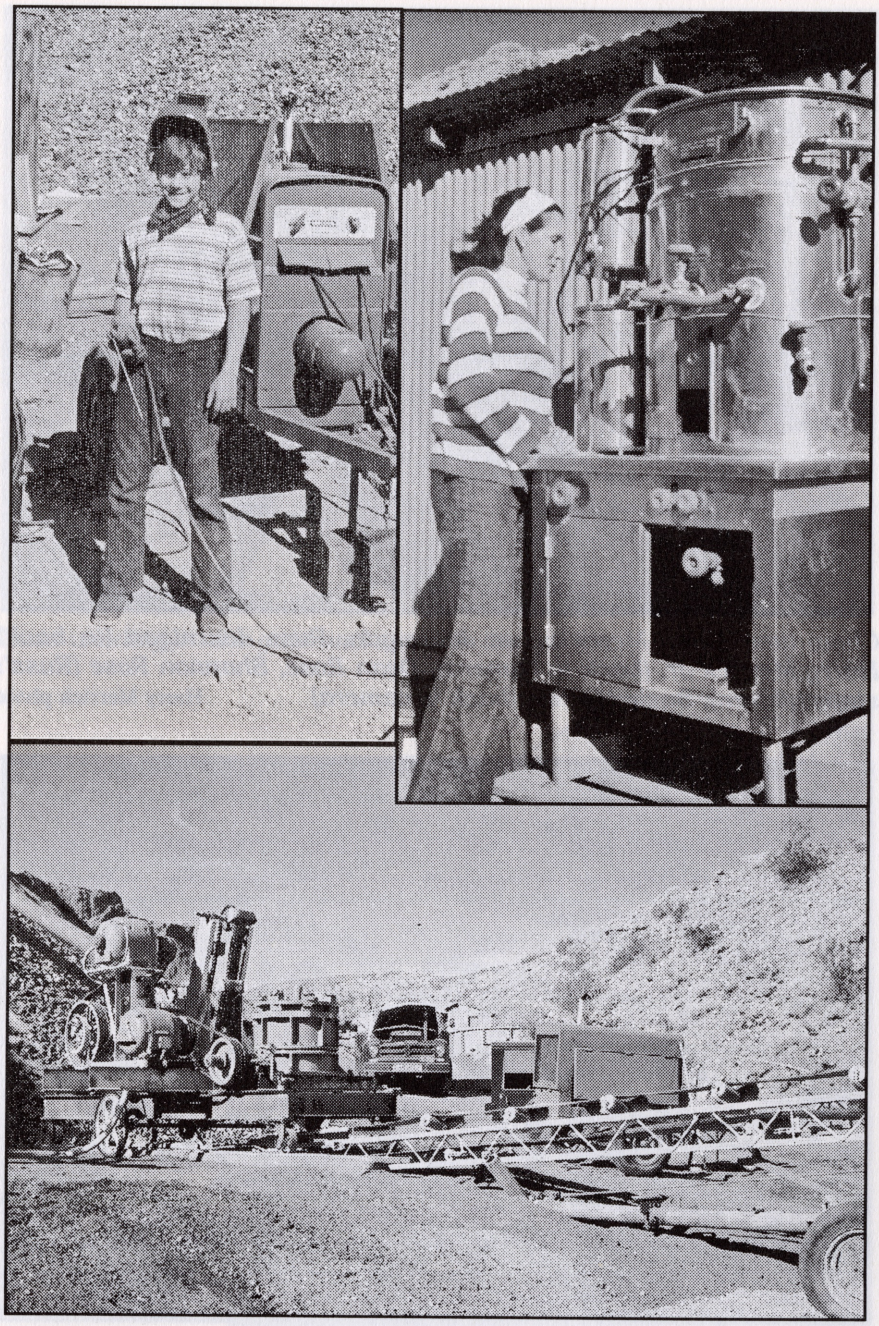
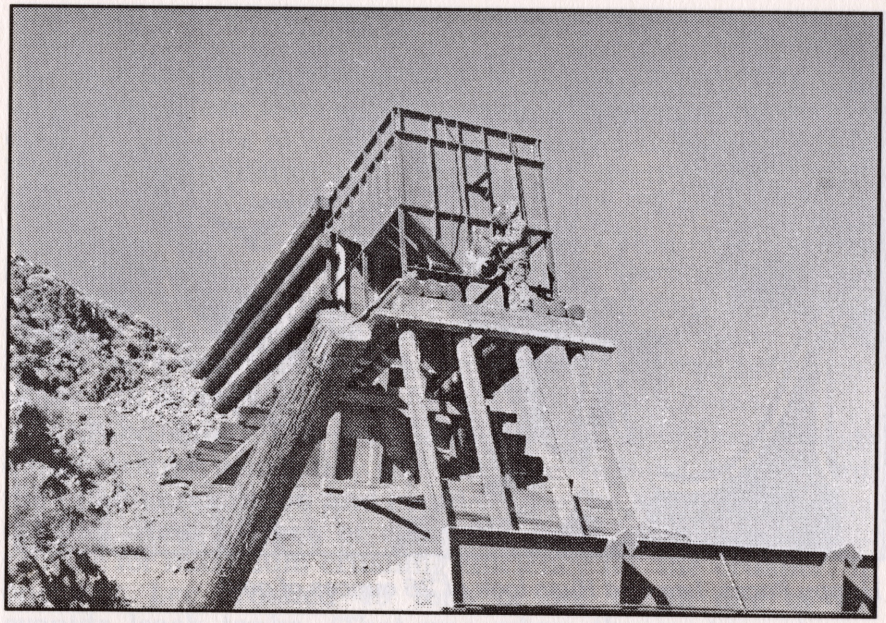
[7] Our children spent their school vacations at the mine. Daren went to Bishop Elementary School. My step-son Dean was out of school and helped to construct the plant; he later moved to Modesto where he was in the building construction business. Our daughter Shannon was married and worked in the escrow and title business in Honolulu and Sacramento.



Daren Journigan, age 12, learns how to weld by working on the ore bin. *Lee Journigan at the desorption boiler with the electrolytic cells attached.* *The completed crusher unit.*

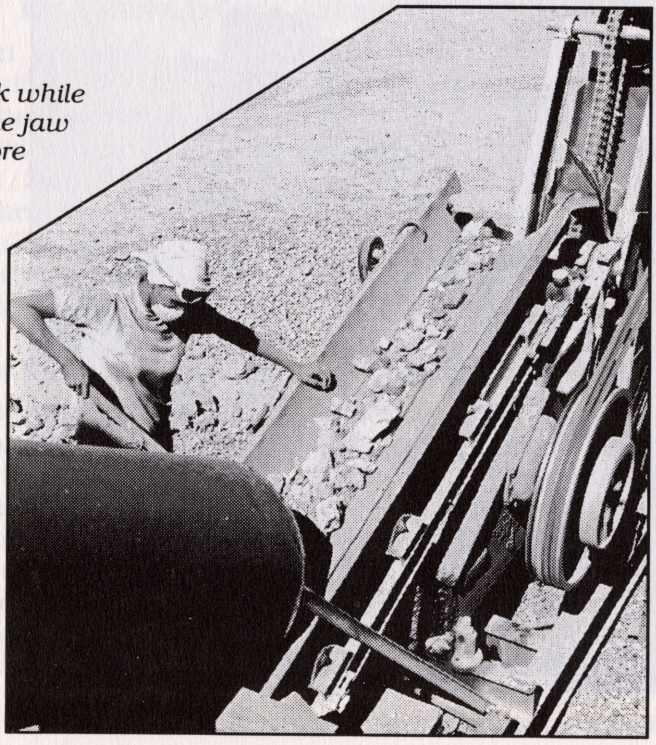
Chow time: Doris Merrick, Lee Journigan, Russ Journigan (in back), Harry Merrick Jr. (back to camera), Dean Rose, Shannon Rose (Russ's step-children), Susie Merrick (back to camera) Harry Merrick photo

Remains of Hell's Garden Arrastre at Telephone Spring after vandals broke it up. Some of the Tucki gold ore was crushed here in the early days.

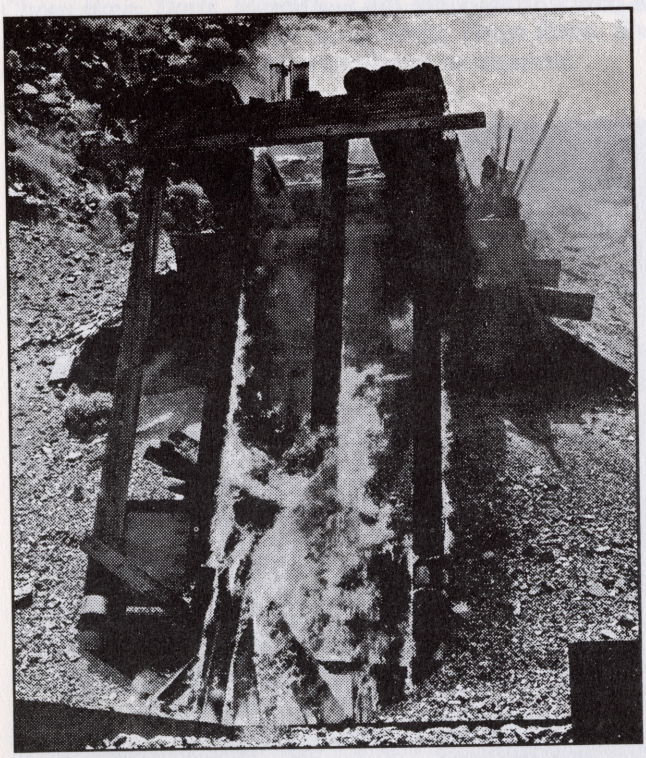


Russ welding on the gate and snout to the ore bin.

Lee wears a mask while feeding ore into the jaw crusher from the ore chute.



Happy Faces. Lee and Russ look at 28 ounces of gold.



Burning the ore Bin after losing the law suit to keep the mine.

The large ore from the dump was conveyed from an ore chute with a gate to a short conveyor belt before going into a Kue-Ken jaw crusher run by a 15 hp electric motor. This brought the ore down to minus 1.5 inch. From there, the ore was picked up by a chain bucket to go into a secondary, gyratory crusher run by a 20 hp motor. The output of this crusher was minus 0.5 inch and dropped onto a conveyor belt that transferred the ore into a seven-ton dump truck. When the truck was loaded, we drove it up the hill to the upper bin situated over the four cyanide leach tanks.

The crushing unit was powered by a 39-kilowatt Buda diesel-electric generator. My wife Lee learned how to run the crusher operation and could tell by the sound of the jaw crusher when to open or close the gate on the ore chute to provide for maximum crushing efficiency for the crusher. In one day, Lee crushed 49 tons of ore to fill one of the cyanide leach tanks. (That was when the equipment was running properly!)

The Newly Designed Cyanide Tanks

Four fifty-ton, rectangular tanks were designed and constructed on reinforced concrete foundations with concrete block sides. They were six feet high and had steel end-doors that bolted into the sides with one-inch bolts. An "O" ring made of 1/2-inch rubber was fitted around the end door to keep the cyanide solution from leaking out of the tank. The steel door was dropped when it was necessary to empty a tank with the BOBCAT front loader that could go right into the tanks. It would take about twenty minutes to empty a 50-ton tank; a far cry from when we had to muck out the tanks by hand!

The first idea was to have Paul plaster the sides of the tanks, inside and out with swimming pool plaster. With anticipation we filled the tanks with 50 tons of gold ore and turned the cyanide solution into tank number one. Guess what? The solution started to leak out the sides of the tanks. I turned off the solution manifold, but it was too late. The pregnant cyanide solution, laden with gold, started spilling out all over the ground, and I couldn't stop the flow! We lost our first charge of gold-laden solution and couldn't

recover it. We took off the end door and mucked out the tank with the front loader.

It was necessary to weld steel liners in each of the cyanide leach tanks. We weren't counting on having to do this, but this sort of thing happens when you start a new venture. After fabricating the steel liners we never had any trouble with cyanide leaks again.

Each tank had in its bottom a thin layer of sand spread out evenly that acted as a sand filter to clarify the pregnant (gold-laden) solution by stopping the silt from going down and clogging the active carbon columns and slowing the solution percolation rate.

The Active Carbon Columns

The new method, or Howard Hughes method, of extracting gold out of a cyanide solution requires running the solution through granulated active carbon instead of zinc dust or zinc shavings used in the old days at my dad's Gold Bottom Mill. The carbon granules are about the size of coffee grounds and are trapped in an enclosure by a screen so that they don't get away in the solution.

My final design to house the carbon columns was made from four-foot-high propane tanks that had a perforated pipe inserted from the top down the center that allowed the pregnant solution coming from the cyanide leach tanks to migrate in the carbon column from the bottom up to the top where the barren solution came out and went to the barren solution tank outside the extractor house. There were five, active-carbon-filled tanks in all, connected in tandem by rubber hose connections, and each tank could be taken out of the circuit individually when the active carbon was loaded with sufficient gold to be removed for the desorption process to get the gold off the carbon.

The Barren Solution Tank

We constructed a Doughboy swimming pool four feet high by thirty feet in diameter to hold the barren solution (cyanide solution with no gold in it) after it was drawn off the active carbon columns below the extractor house. This solution was re-circulated through the system after replenishing it with more cyanide solution and adding lime to keep

the pH at about 10 for efficient gold recovery.[8] We didn't have to add much lime since the Panamint Springs water had a high lime content.

The whole cyanide flow system was run by gravity with only one solution pump used to pump the solution up to the barren solution holding tank above the cyanide leaching tanks. The pump was run once a day for ten minutes to conserve power. The solution strength was measured by titration and was kept to one-half of one percent cyanide in the solution. The pH was measured by a pH meter and was kept at ten to make the extraction efficient.

The Gold Extraction Flow System

After the crushing operation, the system flows like this:

1. The gold ore is put into the cyanide leach tanks (50 tons to each tank).

2. The solution manifold is opened and the barren solution is allowed to percolate through the ore from the top to the bottom of a leach tank.

3. The gold in the ore is dissolved and put into a pregnant (gold-laden) cyanide solution.

4. The pregnant solution comes out through a sand filter in the bottom of the leach tank and is piped to the extractor house, which contains the active carbon columns.

5. The solution goes through the five, tandem, active carbon columns.

6. The gold in the pregnant cyanide solution is adsorbed on the outside of the carbon granules, not as a metal but as a gold salt.

7. As the gold attaches to the carbon (adsorbed), the cyanide solution becomes increasingly weaker in gold content until it becomes "barren."

8. The barren cyanide solution flows to a lower tank where the cyanide strength is brought up to one-half of one percent in the solution. This strength was found by experimentation to be best.

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[8] pH is a value of acidity to alkalinity, acidity being a lower number.

9. The pH of the cyanide solution is brought up to 10 with the addition of lime. This measurement is done with a pH meter. It is necessary to keep the pH level high so as not to create hydrocyanic gas, which is deadly to breathe. Also, low pH reduces the effectiveness of the cyanide to dissolve the gold into solution.

10. The gold content in the pregnant solution must be constantly measured by the wet assay method.[9] I used a Perkin-Elmer Model 303 Atomic absorption machine with a gold gun to aspirate the solution into a flame to measure the gold content. This system was much faster than the old wet assay system that used an assay furnace.

11. When the gold content in the pregnant solution coming out of the leach tanks drops to a certain level, the solution to the leach tanks is turned off and fresh water is turned on to drive the remaining cyanide solution out of the tank by hydrostatic pressure and in to the carbon columns. The remaining ore in the tank is then dumped. A new charge of ore is put into the tank and the process is repeated.

12. To make the system efficient, it is mandatory that constant measurements be made to determine the gold content in the system.

Desorbing the Active Carbon

Once the active carbon is loaded with a sufficient quantity of gold and will not take any more, the gold has to be taken out of the carbon. The gold in the carbon is not in a metallic form and cannot be seen on the carbon; it's in a chemical salt form.

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[9] A wet assay determines gold values in a cyanide solution. The solution is evaporated using lead acetate as a flux and adding hydrochloric acid during the heating process in a muffle (assay) furnace. The sample is then scarified (put in a fire-clay dish) and put in the furnace. When heated, it leaves a gold mesh that can be parted (separated) to get the silver out, thus leaving the gold to be weighed by a sensitive analytical balance. This requires technical expertise and is very time consuming. But with the invention of the atomic absorption machine, wet assays take about ten seconds per sample, while the old method, as was used at the Gold Bottom Mill, took hours per sample.

The gold-laden carbon column is taken out of the adsorption circuit and put into a new circuit called a desorption circuit. This fluid circuit is a cyanide solution mixed with methanol and sodium hydroxide heated to a boiling temperature and circulated through the active carbon column where the gold is stripped off the carbon and put back into solution.

The hot, gold-bearing solution is then run into two electrolytic cells made up of steel wool cathodes. An electric current is connected to the electrolytic cells, and the gold in the solution becomes metallic as it is electroplated onto the steel wool. When all the gold is electroplated out of the solution, determined by wet assay, the active carbon column is returned to the adsorption circuit where, once again, the pregnant gold solution flows through the column, and the gold adsorbs as a gold salt onto the outside of the active carbon granules.

Getting the Gold out of the Steel Wool

Once the gold is plated onto the steel wool, the wool, along with the gold, is acid-washed with hydrochloric acid to dissolve the steel wool and leave the gold in a sludge in the bottom of the vat. Lee did this chore and was good at it!

Preparing the Gold for Smelting

The gold residue now needs to be melted, (smelted) and the gold bullion poured into a cone mold. The charge is fluxed with borax glass and sodium bicarbonate. This, along with the gold, is placed in a crucible that is placed in a propane blast furnace and heated to 2000°F.

When the charge is in a molten stage and is free flowing the crucible is taken from the blast furnace and poured into a cone mold. The flux overflows the mold and the metallic gold falls to the bottom of the mold to make gold bullion.

After the gold cools, a small hole is drilled into the bar and the sample cuttings from the drilling are fire assayed to determine the fineness of the gold. This is done by parting the sample (separating the gold from the silver) to dissolve the silver out of the gold using nitric acid. This makes silver nitrate. The samples are weighed on a button balance both before and after the parting procedure. If there is no silver

in the ore, the weight will remain the same and you will have 24-carat gold, which is 1000 fine. This almost never happens from mined and processed gold.

The Tucki Mine gold ore measured 981 to 990 in fineness, with the rest being in silver to make up the 1,000. The "Gold Bug" emerges, and everyone is happy when you make the pour!

Company at the Tucki

Because the mine was in such a remote location, we didn't have many visitors. Most people would not know what road to take to get up there.

One day when we were working, I looked up and saw an airplane flying over the camp. It was Harry Merrick in his Cessna 170. He dropped a small parachute made of a handkerchief, and on the end was a 35 mm film container that had a message inside telling us to come down and meet him at the Stovepipe Wells airstrip. What a surprise! We jumped in the truck and went down to meet him.

Lee and I stayed out at the mine most of the time alone, as the Barnetts were driving all over the country after we built the processing plant. Lee did the crushing and the cooking and I ran the front loader, did the chemistry and assaying, and fixed the equipment when it broke down.

We were making melts (melting the gold as bullion to be sold) about every two weeks, and Paul sold most of the bullion to a Las Vegas gold refiner. He did most of the selling, with the exception of a 28-ounce melt we sold to the Merricks. That gold assayed 981 in fineness.

The dump ore was getting depleted, and preparations were made to start mining from the 245-foot level where we had a rich streak that ran about one and three-quarters ounce gold per ton. Most of the dump ore was running about one-quarter ounce gold per ton, but we were still getting gold out of it with our new cyanide process, and we had about 2,000 tons to process from the dump.

The Closure

In 1976, the U.S. congress passed a bill that essentially closed all mining in Death Valley National Monument. After the bill was signed by President Ford, a Park Ranger informed

the Journigans that the Tucki Mine operation must come to a halt.

In order to get the government to compensate them for their loss, it was necessary to prove the claim was valid and had commercial value for a prudent man to be successful in mining the property. Russ thought he would not have any trouble proving productivity of the Tucki Gold Mine. After all he had mint receipts signed by the Director of the mint showing the gold production of the mine since 1929; records of the Journigan Gold Bottom Mill showing the production of the Tucki Mine; gold bullion taken from the mine that could be analyzed to assure that the gold came from the Tucki Mine; records from the lessees showing the gold production from 1941-1943; and an open stope on the 245-foot level that showed a profitable ore body.

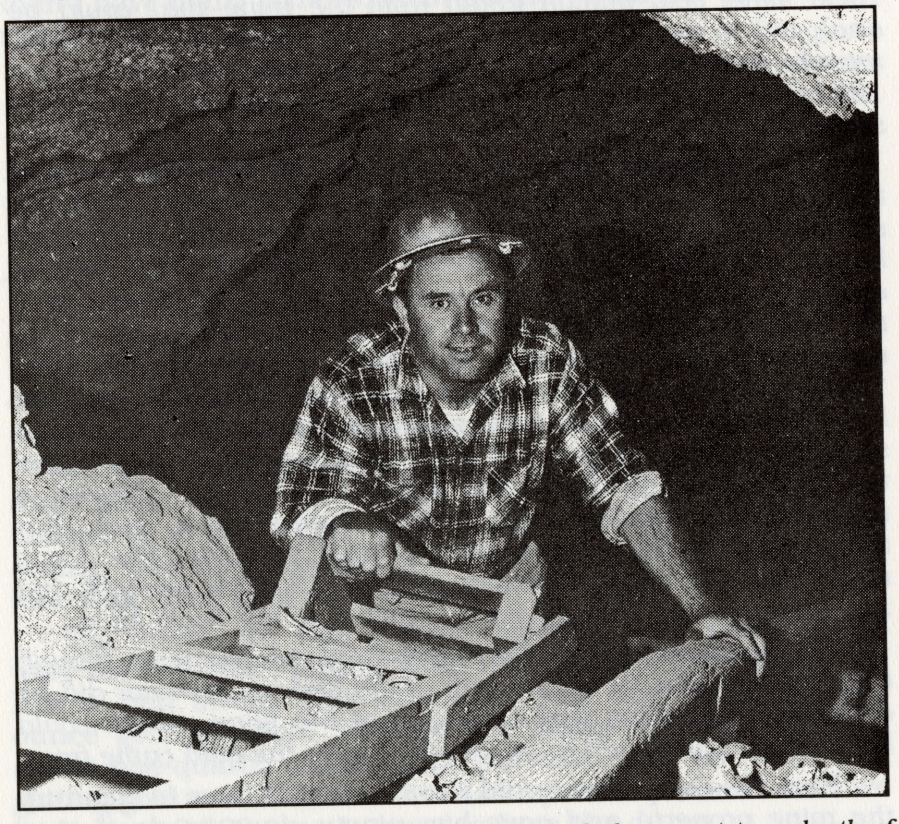
His case came before Federal Court in Sacramento, and the Judge wanted federal mining engineers to cut some samples for assaying. This procedure sounded OK since Russ knew where the good gold ore was. He and his mining engineer, along with two government mining engineers from the Park Service, cut samples at the 245-foot level, split them, and made efforts to assure that none of the samples were "salted." Russ had his samples assayed at one lab, and the Park Service had theirs assayed at another. Russ's assays showed one-half to one and three-quarters ounce of gold per ton of ore. The Park Service engineers' assays showed a tremendously smaller gold content than Russ's, and also theirs showed 60 percent silver in their samples. The Tucki never had any silver according to the U. S. Mint receipts and the assays taken throughout the history of the Tucki Mine.

The Judge did not accept Russ's mint receipts even though they were signed by the Director of the Federal Mint nor did he consider any bullion that came out of the mine, which could be spectrum analyzed to prove what mine the gold came from.

Then the Park Service told Russ he would have to clean up the mine property and gave him ninety days to do it even after the Park Service had title. The Journigans lost their legal battle to keep or to be compensated for the mine.—ed

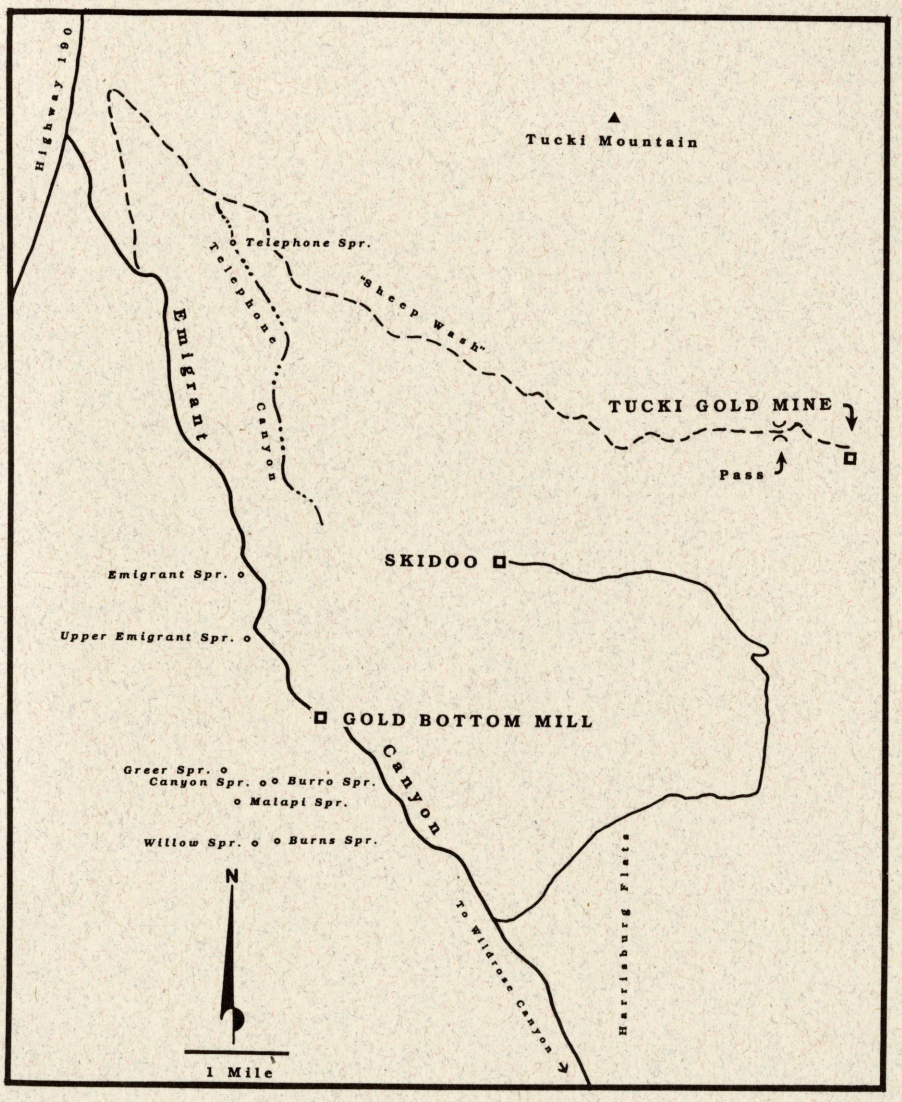
In Conclusion

Looking back on the Tucki Mine saga, in spite of all the hardships and harassments, I was given the chance to develop the mine and put in a successful, active carbon, cyanide processing plant even though the cyanide plant was short lived. When I came out of the mine when it closed down, I looked down from the summit into the property and started to cry that I couldn't have kept it going. That is part of the "Gold Bug" emerging in me again. At seventy-six years of age, I still have it!

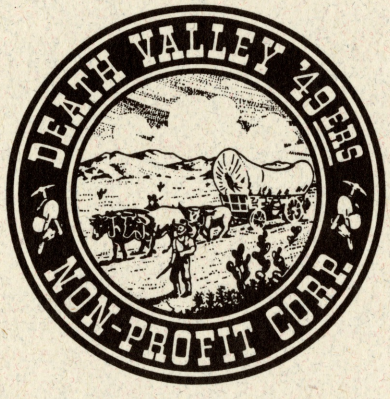


Russ climbing the ladder in the inclined shaft that went to a depth of 310 feet.

See additional writings by Mr. Journigan and more about the Tucki Mine in the *Proceedings* of the 6th Death Valley Conference on History and Prehistory, co-sponsored by the Death Valley '49ers, Death Valley Park Service, Death Valley Natural History Association, and Furnace Creek Inn and Ranch.



Location of the Tucki Mine on Tucki Mountain, Panamint Range south of Stovepipe Wells.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